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(71) Applicant(s)

Caterpillar Inc.
(Incorporated in USA - Delaware)
100 NE Adams Street, Peoria, Illinois 61629-6490,
United States of America

(72) Inventor(s)

Patricia Proksch
Hugh Rillie

(74) Agent and/or Address for Service

Murgitroyd & Company
373 Scotland Street, GLASGOW, G5 8QA,
United Kingdom(51) INT CL⁷

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GB 2224559 A US 5002392 A US 4140200 A

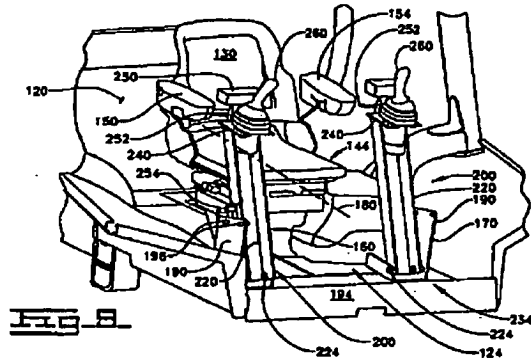
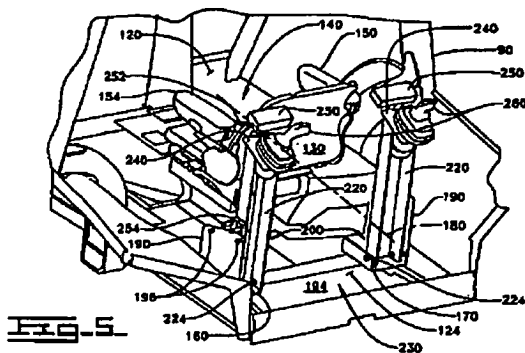
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INT CL⁷ B60K 23/00 28/00, B60N 2/38, E02F 9/18
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(54) Abstract Title

Tiltable control console for a backhoe loader machine

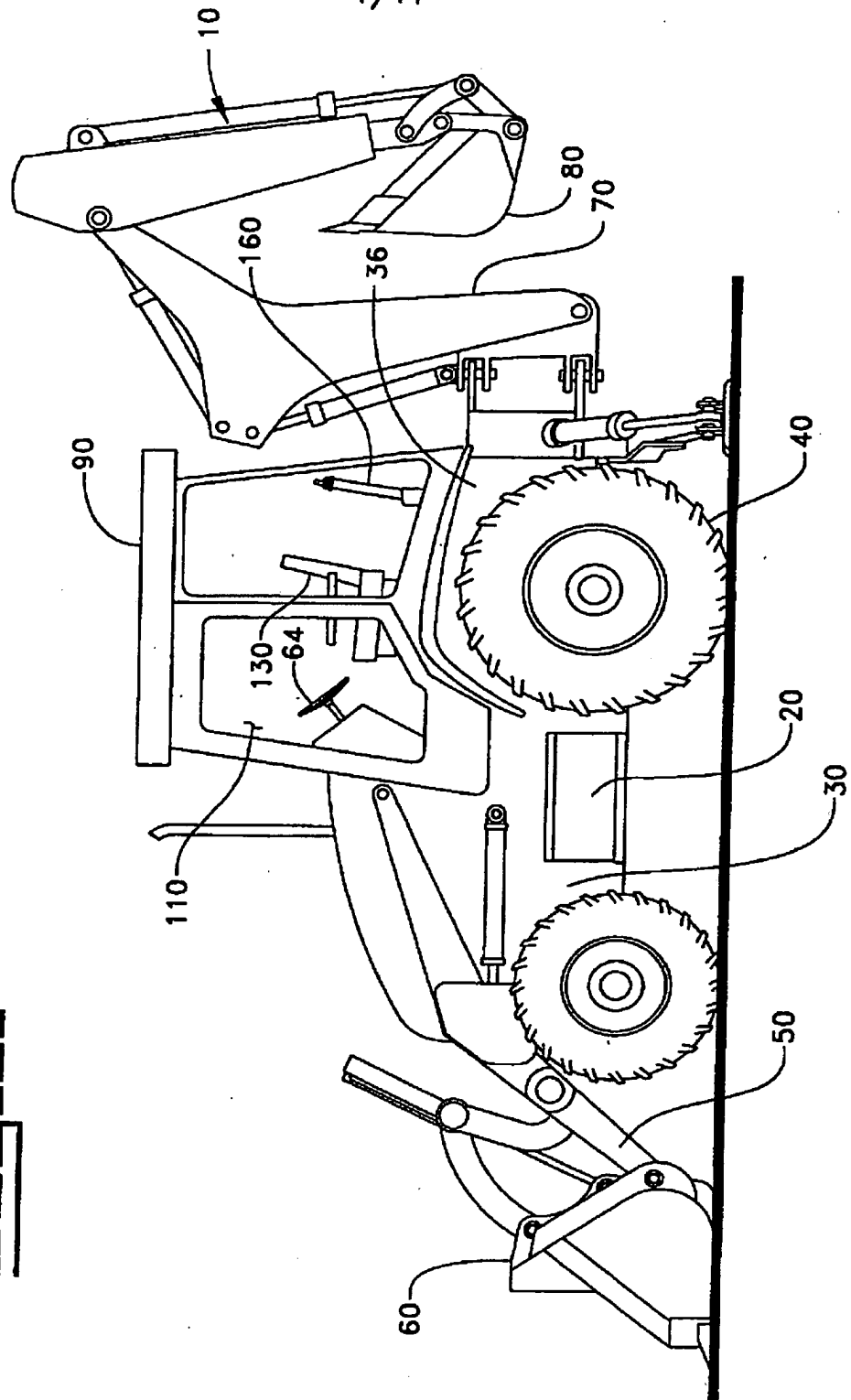
(57) A tiltable control console 160 is positioned at the rear of a cab of a backhoe loader machine, and includes a tower assembly 200 that pivots about pins 224 between a stowed position (Fig.5) and an operating position (Fig.9), a joystick controller 260 mounted on the tower assembly, and a wrist rest 250. To operate a loader bucket (60, Fig.1), seat 130 is in the front position, and to operate a backhoe bucket (80) the operator rotates the seat from the front position to the rear position. At that time, the operator moves the control console from the stowed position to the operating position through the movement of the tower assembly. The illustrated machine has a second control console 170.



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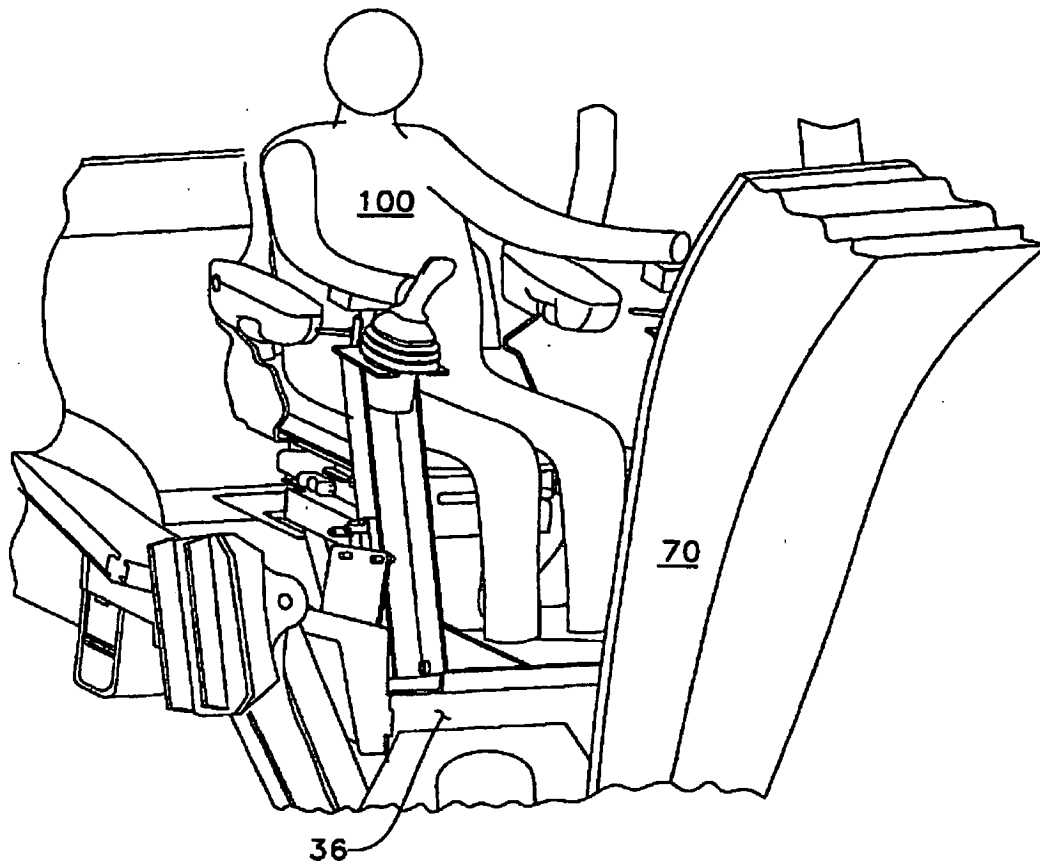
At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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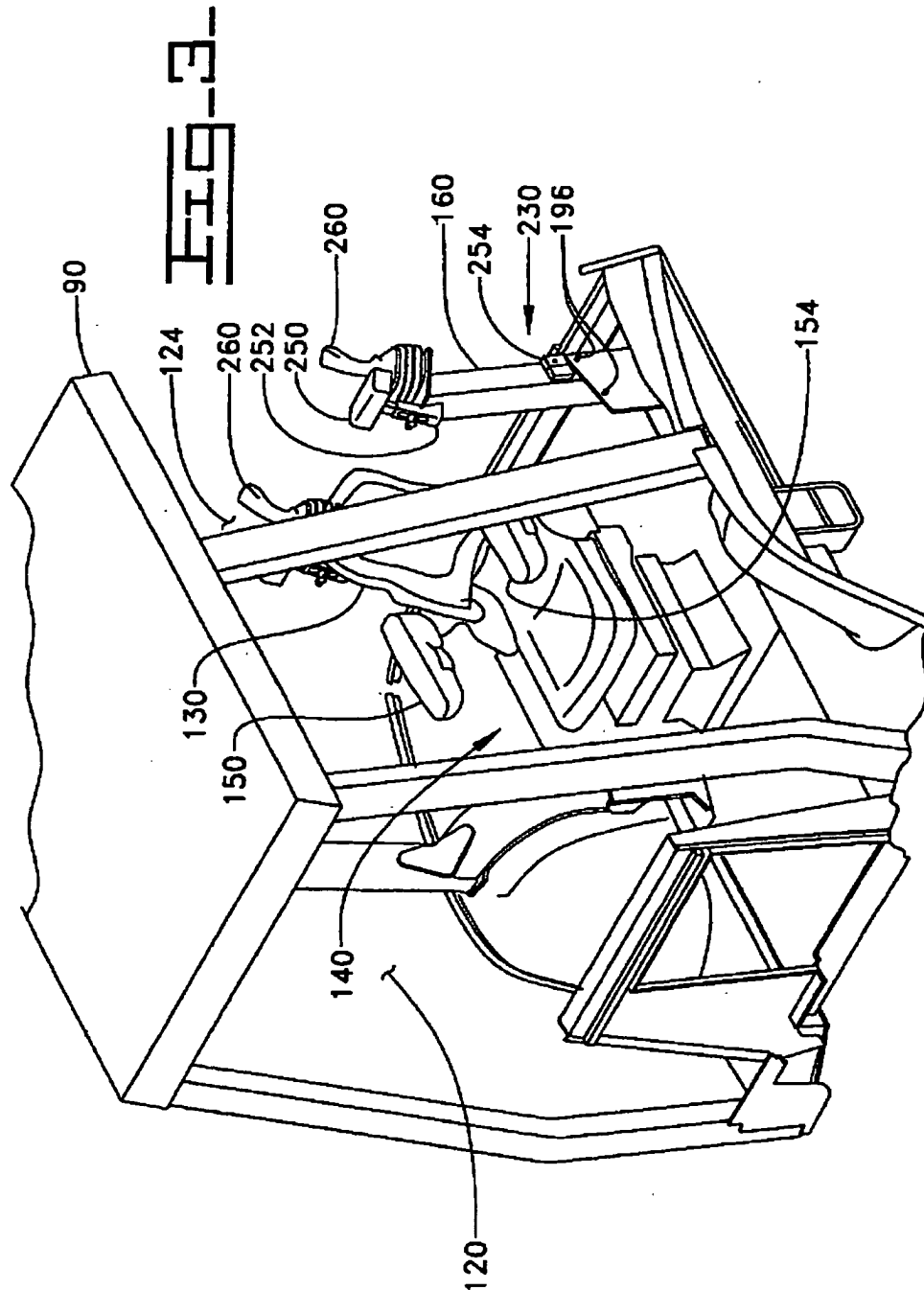
FIG. 1

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Fig-2-



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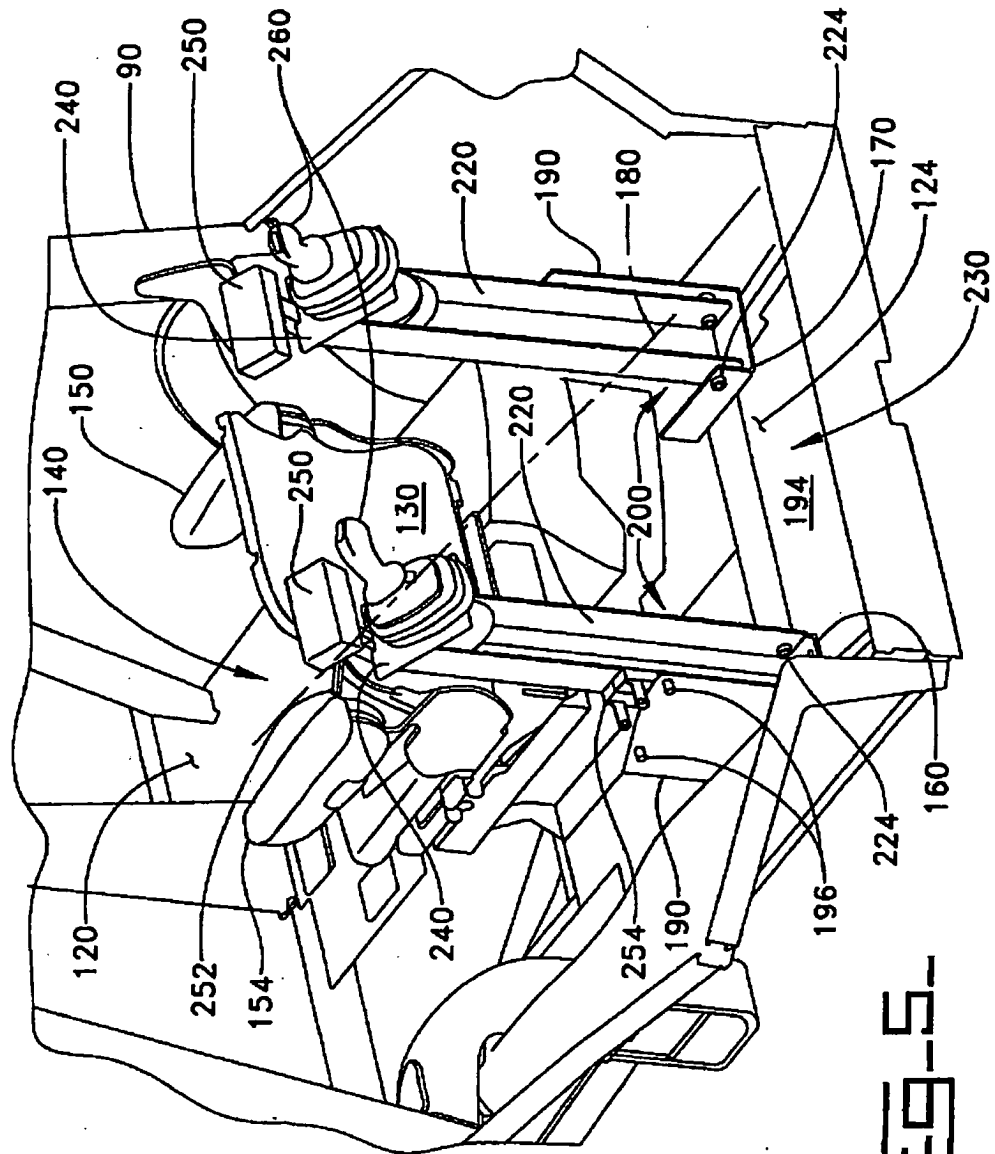


FIG-5-

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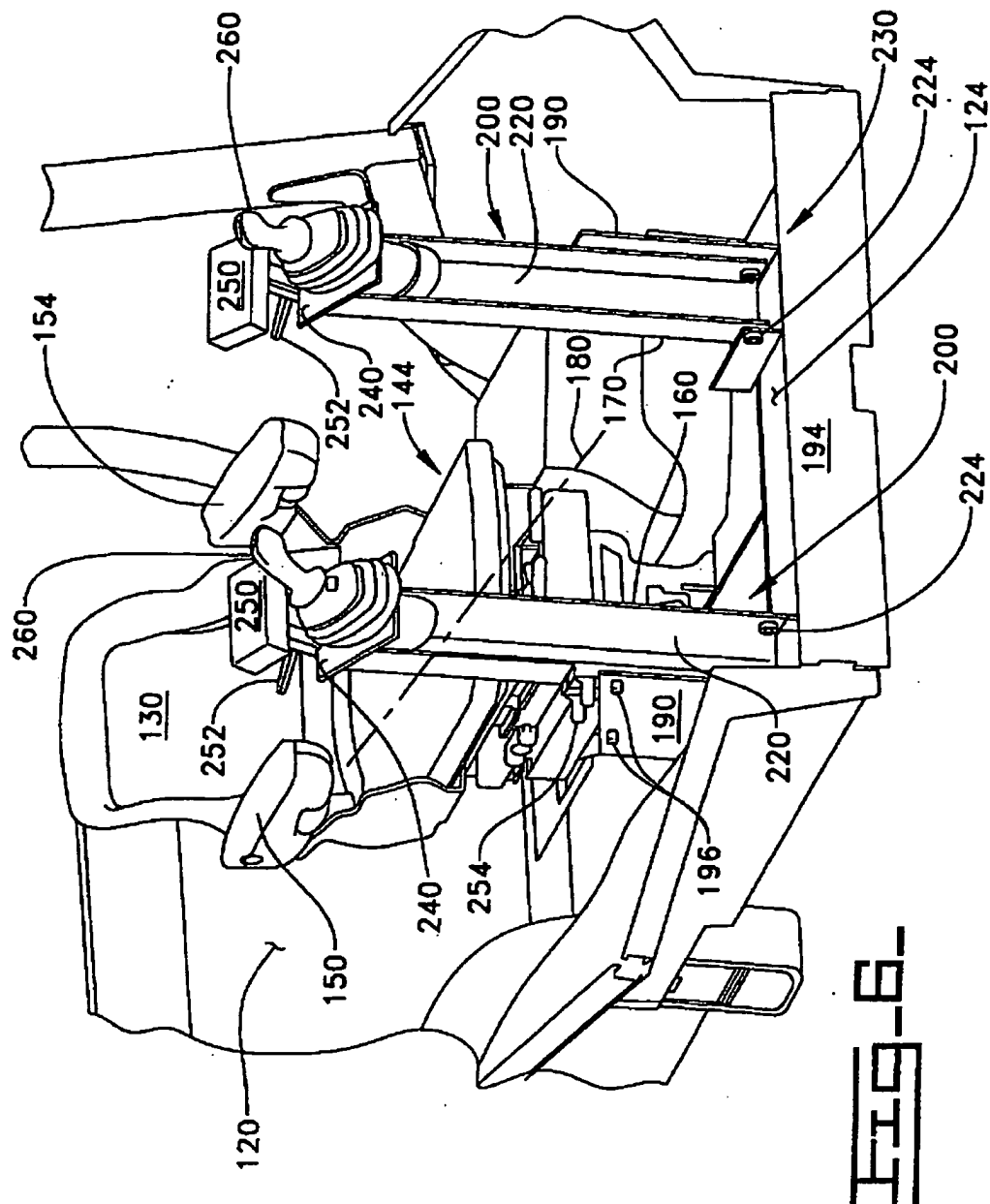
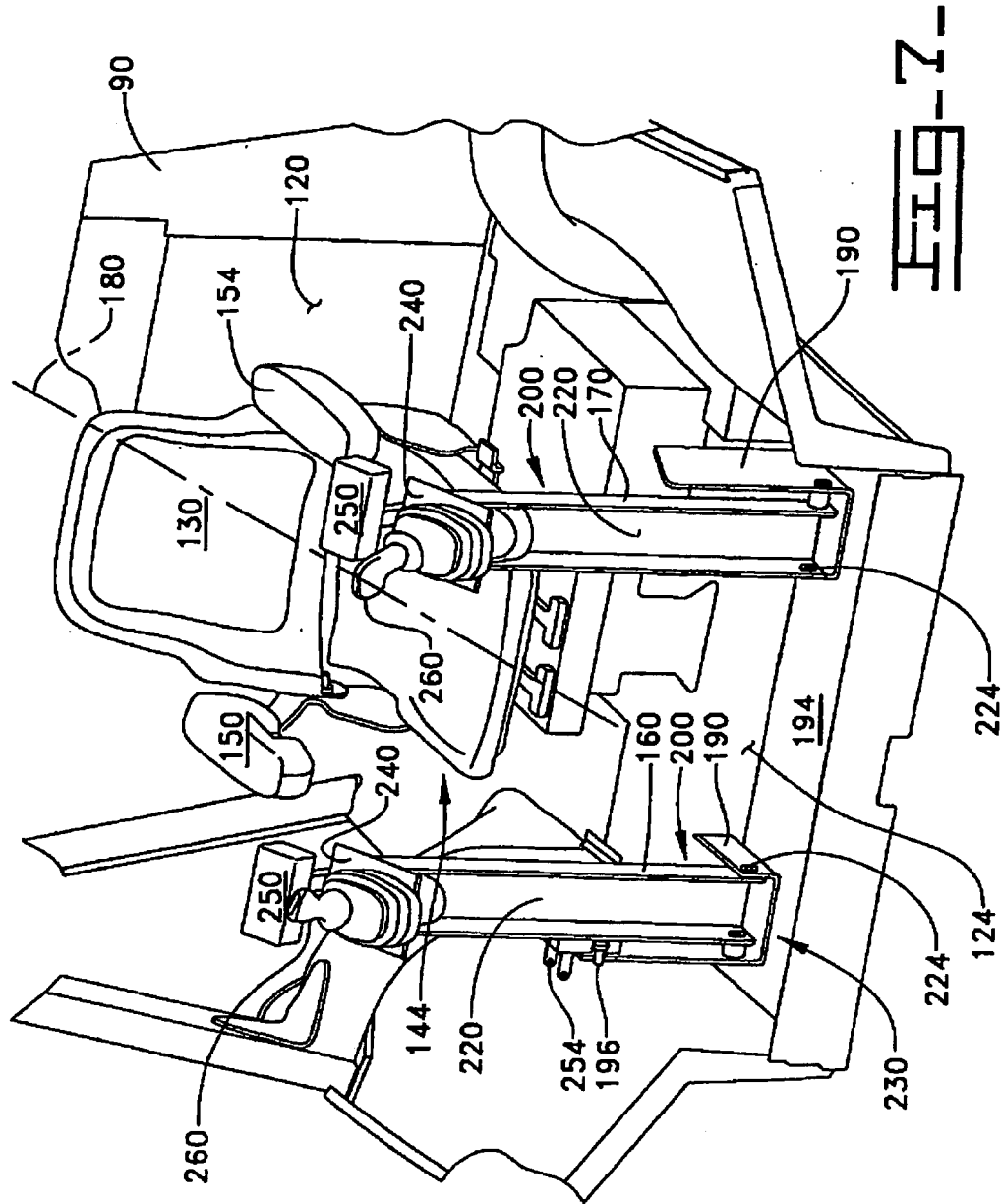
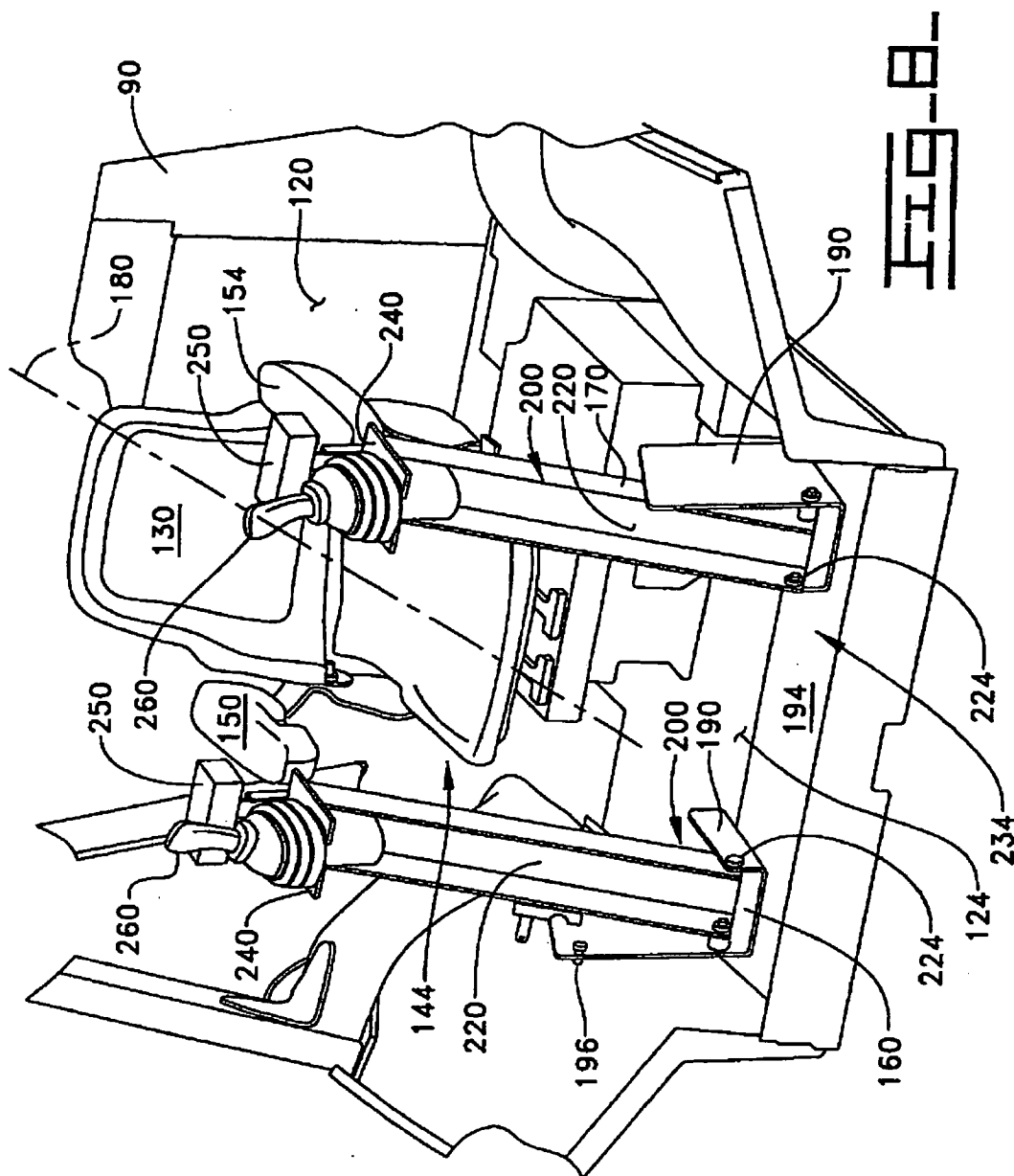


FIG-6-

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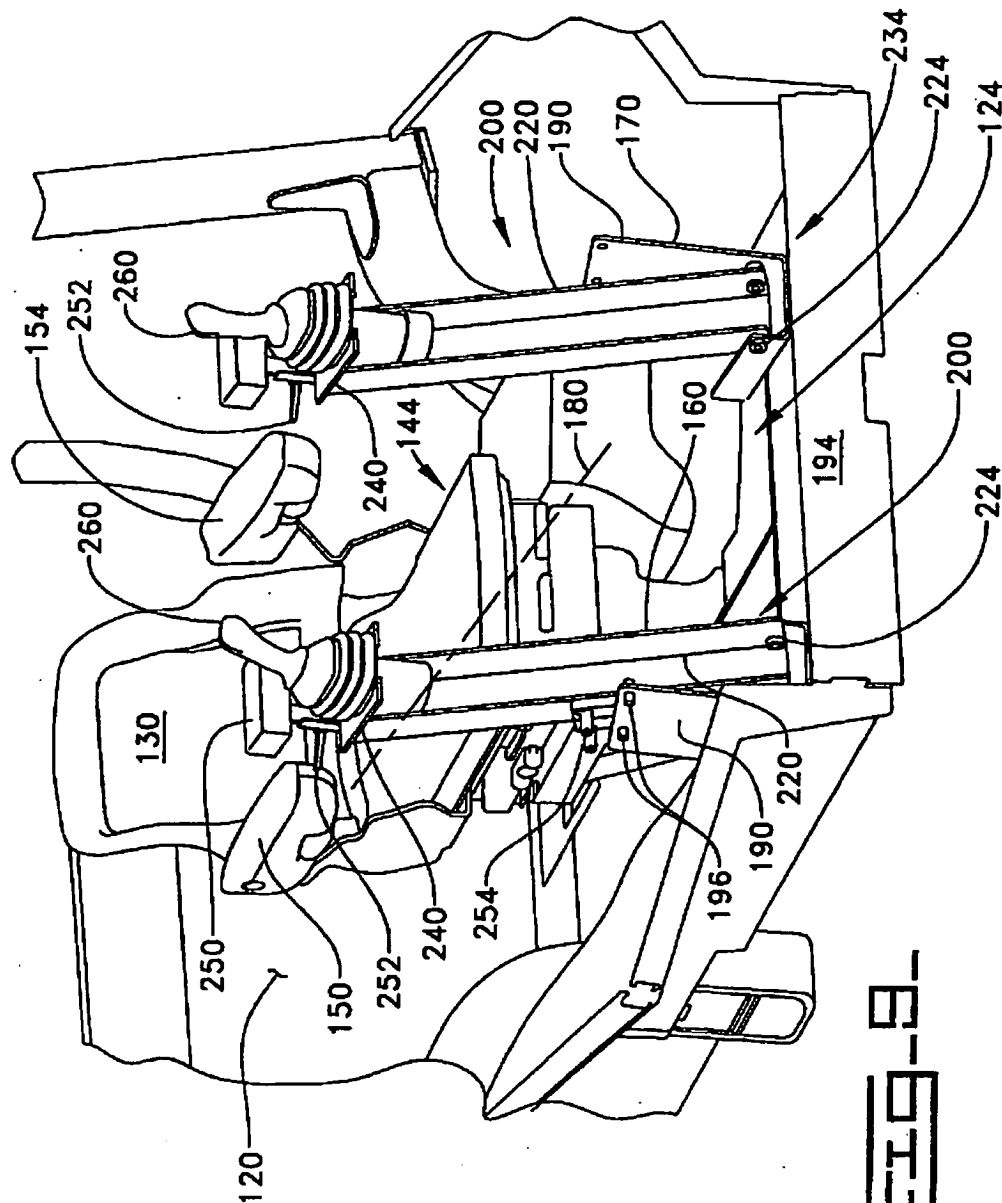
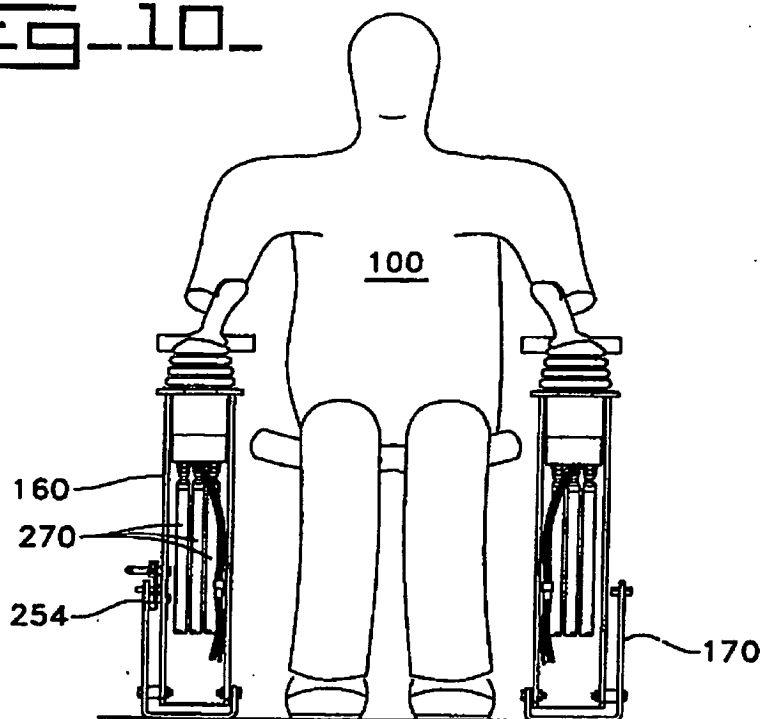
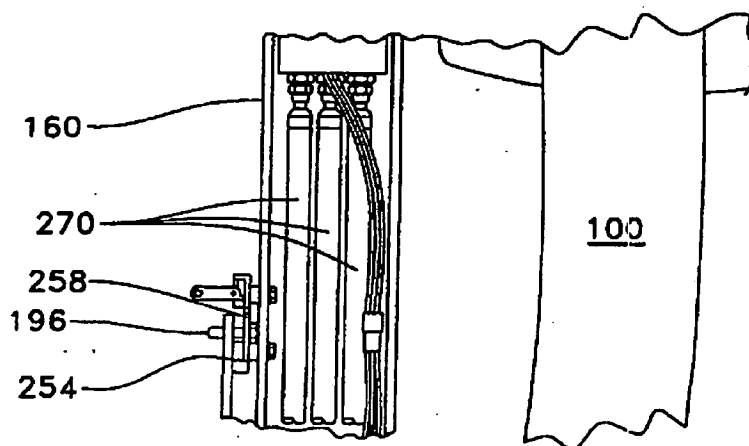
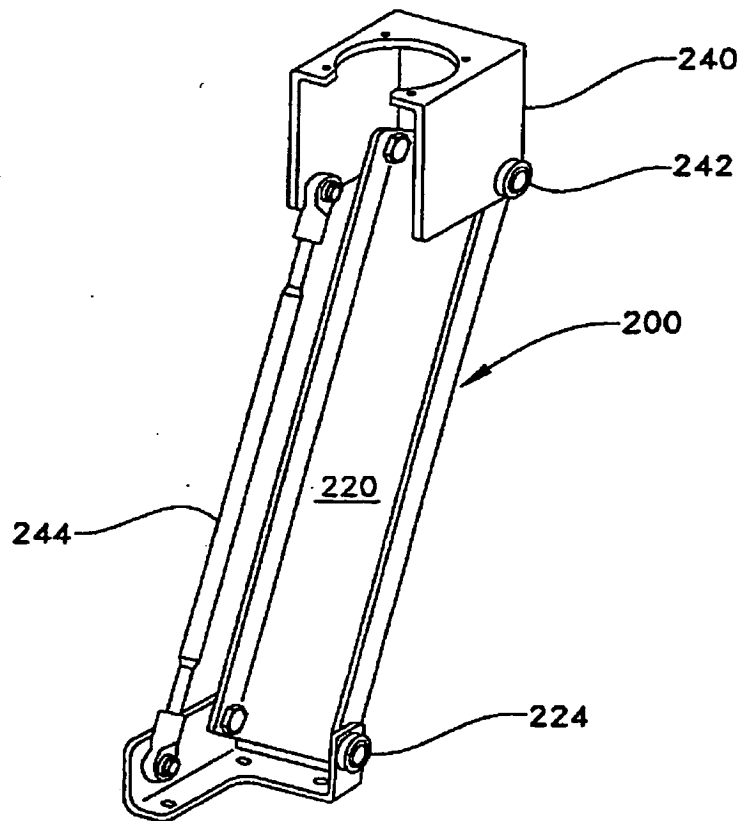


FIG-9-

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Fig-10-Fig-11-

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Fig. 12

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DescriptionTILTABLE CONTROL CONSOLE FOR A BACKHOE LOADER MACHINETechnical Field

10 This invention relates generally to a
tiltable control console for a backhoe loader
machine. More particularly, the invention relates to
the ability of the control console to be maintained
in a stowed position when an operator is not
15 operating the backhoe functions of the machine and
the ability to move the control console to an
operating position when the operator desires
operating the backhoe functions of the machine, the
control console being moved in a manner that
20 positions it ergonomically for the operator's
utilization.

Background Art

25 It is well-known in the prior art to
utilize a control console for a backhoe loader
machine for operating specific backhoe functions.
Typically, the control console is fixably mounted in
a rear interior portion of a cab. In order for an
operator to control the specific backhoe functions,
30 the operator must rotate a seat mounted within the
cab from a front position for operating specific
loader functions to a rear position. Once the seat
is in the rear position, it must be subsequently
moved toward the rear of the machine to position the
35 operator near the control console. Generally, the

5 control console is positioned between the legs of the operator during control of the specific backhoe functions. Additionally, operator input to the control console mechanically controls the specific backhoe functions.

10 In the well-known design, the fixed mounting of the control console in the rear interior portion of the cab increases the spatial requirements of the cab. The increased spatial requirements are necessary because the operator must be able to rotate
15 the seat from the front position to the rear position. The rotation of the seat requires a certain amount of space between the control console and the legs of the operator. Unfortunately, the space significantly distances the operator from the
20 control console. Therefore, the seat is moved toward the rear of the machine to position the operator near the control console thus requiring additional floor space. Further, the position of the control console between the legs of the operator reduces visibility
25 at the rear of the machine and forces the operator to control the specific backhoe functions of the machine at a location that may not be ergonomically sound. The ability of an operator to ergonomically control the specific backhoe functions of the machine results
30 in less operator fatigue and inefficiency. Therefore, it is important to ergonomically position the control console for maximum operator ease and control. Additionally, the mechanical control of the specific backhoe functions of the machine through the
35 control console may provide lower control

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5 sensitivity. Therefore, precise control of the
specific backhoe functions of the machine may be
limited.

The present invention is directed to overcoming the
10 problems as set forth above.

Disclosure of the Invention

In one aspect of the present invention, a
tiltable control console is used on a backhoe loader
15 machine. The backhoe loader machine has a frame, a
cab mounted on the frame with front and rear interior
portions, and a seat with a centerline positioned
within the cab and rotatably mounted thereto for
movement between front and rear positions. The
20 tiltable control console comprises a tower assembly
positioned within the rear interior portion of the
cab and tiltably mounted therewith for movement
between stowed and operating positions. Further, the
present invention includes a controller connected
25 with the tower assembly for operating specific
functions of the backhoe loader machine. The
controller is not utilized to operate the backhoe
loader machine when the tower assembly is in the
stowed position or the seat is in the front position.
30 However, the controller is utilized to operate the
backhoe loader machine when the tower assembly is in
the operating position and the seat is located in the
rear position.

In another aspect of the present invention,
35 a backhoe loader machine is disclosed for use by an

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5 operator. The backhoe loader machine includes a
frame, a cab mounted on the frame with front and rear
interior portions, and a seat with a centerline
positioned within the cab. The backhoe loader
machine comprises a control console. The control
10 console includes at least one tower assembly
positioned within the rear interior portion of the
cab and tiltably mounted therewith and at least one
controller connected with the at least one tower
assembly for operating specific functions of the
15 backhoe loader machine. The at least one tower
assembly is movable between a stowed position and an
operating position.

In yet another aspect of the present
invention, a method of operating a backhoe loader
20 machine is disclosed. The backhoe loader machine has
a frame, a cab mounted on the frame with front and
rear interior portions, and a seat with a centerline
positioned within the cab and rotatably mounted
thereto for movement between front and rear
25 positions. The method of operating the backhoe loader
machine comprises the steps of mounting a control
console within the rear interior portion of the cab
for movement between stowed and operating positions.
Then, maintaining the control console in the stowed
30 position when the seat is in the front position.
Next, moving the seat from the front position to the
rear position. Finally, moving the control console
from the stowed position to the operating position so
that an operator may utilize the control console for

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5 operating specific functions of the backhoe loader machine.

The present invention includes a tiltable control console positioned within a cab of a backhoe loader machine. The backhoe loader machine includes
10 a seat mounted therein rotatable between front and rear positions. The control console includes a tower assembly that enables tiltable movement between stowed and operating positions and a controller connected with the tower assembly. An operator is
15 able to operate the loader and backhoe functions of the machine when the seat is in either of the front or rear positions. However, the ability to stow the control console allows for increased operator space and control while decreasing the necessary spatial
20 requirements for the cab. Additionally, the operating position of the tower assembly provides easy access to the controller so that operator fatigue is reduced.

25 Brief Description of the Drawings

Fig. 1 is a side view of a backhoe loader machine including the tiltable control console of the present invention;

Fig. 2 is a partial, perspective view taken
30 from the rear of a backhoe loader machine showing an operator utilizing the present invention;

Figs. 3-4 are partial, perspective views of a cab of the backhoe loader machine, taken from the front and rear thereof, respectively, featuring a
35 seat therein (shown in a front position) facing away

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5 from the present invention (shown in a stowed position);

Fig. 5 is a partial, perspective close-up views of the cab taken from the rear side of the backhoe loader machine showing the present invention
10 in the stowed position;

Figs. 6-7 are partial, perspective close-ups of the cab taken from the rear side of the backhoe loader machine showing the present invention in the stowed position;

15 Figs. 8-9 are partial, perspective close-ups of the cab taken from the rear side of the backhoe loader machine showing the present invention in an operating position;

Fig. 10 is a view of the present invention detailing the internal control structure for operating the backhoe loader machine disposed within a tower assembly of the control console;

25 Figs. 11 is a detail drawing of a latch mechanism used to lock the present invention in the stowed and operating positions; and

Fig. 12 is a perspective view of an alternative tower assembly of the present invention detailing the various components thereof.

30 While the invention is susceptible to various modifications and alternative forms, a specific embodiment thereof has been shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that
35 there is no intent to limit the invention to the

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5 particular form disclosed, but on the contrary, the
intention is to cover all modifications, equivalents,
and alternatives falling within the scope of the
invention as defined by the appended claims.

Referring to Figs. 1-2, a work machine 10,
10 such as a backhoe loader, is shown incorporating the
present invention. It should be understood that any
other type of work machine utilizing a backhoe loader
function at one end of the machine in cooperation
with another work function at an opposite end of the
15 machine may also be considered within the scope of
the present invention. The work machine 10 includes
a frame 20 with front and rear end portions 30,36
supported by a plurality of wheels 40. A lift arm
assembly 50 is conventionally mounted to the front
20 end portion 30 of the frame 20 for supporting an
attachment 60, such as a loader bucket, in a well-
known manner. A boom and stick assembly 70 is
conventionally mounted to the rear end portion 36 of
the frame 20 for supporting an attachment 80, such as
25 a backhoe bucket, in a well-known manner. A cab 90
is mounted on the frame 20 for partially enclosing an
operator 100 within an operating compartment 110.
The cab 90 includes front and rear interior portions
120,124, seen best in Figs. 3-9, which correspond to
30 the front and rear end portions 30,36, respectively,
of the frame 20. A seat 130 is rotatably mounted
within the cab 90 for movement between front and rear
positions 140,144 and includes a pair of armrests
150,154. As seen in Figs. 3-5, the front position
35 140 of the seat 130 faces the front interior portion

5 120 of the cab 90 which allows the operator 100 to
control specific functions of the loader bucket 60
through conventional control means 64. It should be
understood that the control means 64 for the specific
functions of the loader bucket 60 are shown only in
10 Fig. 1 and have been removed from the remaining
drawings for visual clarity. As seen in Figs. 6-9,
the rear position 144 of the seat 130 faces the rear
interior portion 124 of the cab 90 which allows the
operator 100 to control specific functions of the
15 backhoe bucket 80 through a pair of control consoles
160,170. Although a pair of control consoles 160,170
are shown, it should be understood that the specific
functions of the backhoe bucket 80 could be
controlled with a single control console. The seat
20 130 has a centerline 180 parallel with the
longitudinal axis (not shown) of the frame 20.

Referring to Figs. 3-9, the control
consoles 160,170 are positioned within the rear
interior portion 124 of the cab 90 on opposite sides
25 of the centerline 180 of the seat 130. For
simplicity and ease of understanding, only one
control console 160 will be discussed in detail. It
should be understood that the components for the
control consoles 160,170 are identical although the
30 control consoles 160,170 may control different
specific functions of the backhoe bucket 80.
Therefore, reference numerals used to designate
components of control console 160 will also be used
to designate the same components of control console
35 170. It should also be understood that some

5 components of control console 170 may not be shown in
the drawings, however, all components of control
console 160 can be utilized on control console 170.
The control console 160 includes a base 190 fixedly
10 mounted to a floor 194 of the cab 90 and a tower
assembly 200, seen best in Figs. 5-9. The base 190
includes an elongated side wall portion with a pair
of pins 196 extending therefrom, such as a striker
bolt, seen best in Fig. 7. The tower assembly 200
15 includes an elongated, channel shaped tower 220
pivotally connected at a lower portion thereof to the
base 190 in any suitable manner, such as through the
utilization of pivot pin joints 224. The tower 220
defines stowed and operating positions 230,234 of the
control console 160, seen best in Figs. 6 & 9,
20 respectively, when pivoted about the base 190. It
should be understood that although only one operating
position is shown for the control console 160, it is
possible that a plurality of operating positions may
be utilized with the present invention. The tower
25 assembly 200 also includes a control mounting
platform 240 fixedly connected to an upper portion of
the tower 220 for movement therewith. It should be
understood that the control mounting platform 240 may
also include adjustable movement, as seen in the
30 alternative design of Fig. 12. For instance, the
control mounting platform 240 may be pivotally
connected to the upper portion of the tower 220 in
any suitable manner, such as pivot pin joints 242. A
linkage rod 244 is pivotally connected in any
35 suitable manner at a first end to the base 190 and at

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5 a second end to the control mounting platform 240 to
establish a substantial parallelogram structure. The
pivotal connections on the alternative design of Fig.
12 allow the control mounting platform 240 to adjust
to any desired position by the operator 100. As can
10 be seen in Fig. 6, a wristrest assembly 250 is
fixedly mounted on the tower 220 and is adjustable in
any suitable manner, such as a mechanical adjuster
252, to individually fit the operator 100. The
wristrest assembly 250 is mounted on the tower 220 so
15 that it is adjacent the seat 130 when the control
console 160 is in the operating position 234. It
should be understood that the wristrest assembly 250
may be used with the present invention to accommodate
various operators (not shown). A double latch
20 mechanism 254 is seen best in Figs. 5, 9, and 11 and
includes a pair of opposed latches, one of which is
shown at 258 in Fig. 11. The latch mechanism 254 is
fixedly mounted to the tower 220 and operates in any
suitable manner so that a respective one of the pins
25 196 is captured by a respective latch 258 to lock the
control console 160 in the respective stowed or
operating positions 230, 234. It should be understood
that although only one latch mechanism 254 is shown
in the drawings for control console 160, a latch
30 mechanism 254 could be utilized on control console
170 to achieve the same function.

Referring to Figs. 5-10, the control
console 160 also includes a controller 260, such as a
joystick, fixedly mounted to the control mounting
35 platform 240. The controller 260 utilizes pilot

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5 hydraulics to control the specific functions of the
backhoe bucket 80 through a plurality of hydraulic
lines 270, seen only in Figs. 10-11. It should be
understood that the hydraulic lines 270 have been
removed from the remaining drawings for visual
10 clarity. The hydraulic lines 270 are disposed within
an interior region of the tower 220 for connection
with the controller 260. Although not described in
detail, it should be understood that the controller
260 operates in a well-known manner to hydraulically
15 actuate a plurality of spool valves (not shown) via
hydraulic lines 270. Although hydraulic actuation of
spool valves (not shown) is well-known to control
various machine functions, it should be understood
that the application of pilot hydraulics to control
20 the specific backhoe bucket functions of a backhoe
loader machine (10) is not well-known. Although
pilot hydraulics are utilized in the drawings, it
should also be understood that any suitable operating
controls, such as mechanical, electro-hydraulic, and
25 the like, are within the scope of the present
invention.

Industrial Applicability

During operation of the work machine 10, it
30 may be necessary for the operator 100 to operate both
the controls for the specific functions of the loader
bucket 60 and the controls for the specific functions
of the backhoe bucket 80. The tiltable control
consoles 160, 170 are provided so that during
35 operation of the specific functions of the loader

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5 bucket 60, the control consoles 160,170 may be
maintained in the stowed position 230 which is locked
in place through the well-known action of one of the
pair of latches 258. When the operator 100 rotates
the seat 130 from the front position 140 to the rear
10 position 144 for operating the specific functions of
the backhoe bucket 80, the stowed position 230
establishes a clearance space between the seat 130
and the controllers 260 so that the operator 100 has
sufficient leg room during seat repositioning. The
15 control consoles 160,170 are then moved to the
operating position 234 by releasing the latch 258
from the respective pin 196 (seen best in Fig. 8) and
pivotally moving the tower 220 until the other one of
the pair of latches 258 acts in a well-known manner
20 to lock the control consoles 160,170 in place. The
operating position 234 of the control consoles
160,170 establishes a working space between the seat
130 and the controllers 260 wherein both legs of the
operator 100 are between the control consoles 160,170
25 for increased operator visibility from the rear of
the work machine 10. The operating position 234
locates the controllers 260 and wristrest 250
adjacent the respective armrests 150,154 of the seat
130 so that the operator's arms may simultaneously
30 rest on the armrest 150,154 and the wristrests 250 so
that the operator 100 may easily hand operate the
controllers 260. However, it should be understood
that the operator 100 may prefer to not use the
wristrests 250 and they may be removed without
35 limiting the scope of the invention. The ability to

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5 move the control consoles 160,170 to the operating
position 234 eliminates additional positioning of the
operator 100 thereby decreasing the spatial
requirements of the cab 90. Additionally, the
operating position 234 ergonomically locates the
10 controllers 260 so that the operator 100 may easily
control the specific functions of the backhoe bucket
80 with less fatigue than in conventional designs.
Once the control consoles 160,170 are in the
operating position 234, the operator 100 may move the
15 controllers 260 either separately or simultaneously
to actuate the spool valves (not shown) through the
incorporation of pilot hydraulic controls to achieve
the desired specific functions of the backhoe bucket
80. The ability to utilize pilot hydraulic controls
20 for this purpose increases the sensitivity of the
control function and allows for more precise movement
of the backhoe bucket 80.

Other aspects, objects and advantages of
this invention can be obtained from a study of the
25 drawings, disclosure and the appended claims.

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Claims

1. A tiltable control console for use on a backhoe loader machine having a frame, a cab mounted on the frame with front and rear interior portions, and a seat positioned within the cab and rotatably mounted thereto for movement between front and rear positions and having a centerline, comprising:

10 a tower assembly positionable within the rear interior portion of the cab and tiltably mountable therewith for movement between stowed and operating positions; and

15 a controller connected with the tower assembly for operating specific functions of the backhoe loader machine, the controller not being utilized to operate the backhoe loader machine when the tower assembly is in the stowed position or the seat is in the front position and being utilized to operate the backhoe loader machine when the tower assembly is in the operating position and the seat is located in the rear position.

2. A tiltable control console as claimed in claim 1, wherein the tower assembly and controller may be positioned on either side of the centerline of the seat.

3. A tiltable control console as claimed in claims 1 or 2, wherein the stowed position of the tower assembly defines a predetermined space between the seat and the controller and the operating

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5 position of the tower assembly defines a
predetermined space between the seat and the
controller that is less than the predetermined space
defined by the stowed position of the tower assembly.

10 4. A tiltable control console as claimed
in any of claims 1 to 3, wherein the controller is
positioned adjacent a predetermined portion of the
seat when the tower assembly is in the operating
position.

15 5. A tiltable control console as claimed
in any of claims 1 to 4, wherein the controller
operates the specific functions of the backhoe loader
machine through the incorporation of pilot hydraulic
20 controls.

25 6. A tiltable control console as claimed
in claim 1, including a second tower assembly
positionable within the rear interior portion of the
cab and tiltably mountable therewith for movement
between stowed and operating positions and a second
controller connected with the second tower assembly
for operating additional specific functions of the
backhoe loader machine, the second controller not
30 being utilized to operate the backhoe loader machine
when the second tower assembly is in the stowed
position or the seat is in the front position and
being utilized to operate the backhoe loader machine
when the second tower assembly is in the operating

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5 position and the seat is located in the rear
position.

7. A tiltable control console as claimed
in claim 6, wherein the stowed position of the second
10 tower assembly defines a predetermined space between
the seat and the second controller and the operating
position of the tower assembly defines a
predetermined space between the seat and the second
controller that is less than the predetermined space
15 defined by the stowed position of the tower assembly.

8. A tiltable control console as claimed
in any of claims 6 or 7, wherein the second
controller is positioned adjacent a predetermined
20 portion of the seat when the second tower assembly is
in the operating position.

9. A tiltable control console as claimed
in any of claims 6 to 8, wherein the first tower
25 assembly and controller are positioned on one side of
the centerline of the seat and the second tower
assembly and controller are positioned on the other
side of the centerline of the seat opposite the first
tower assembly and controller.

30
10. A tiltable control console as claimed
in any of claims 6 to 9, wherein the first and second
controllers are operatively associated for operating
the respective specific functions of the backhoe
35 loader machine, the first and second controllers not

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5 being utilized to operate the backhoe loader machine
when the first and second tower assemblies are in the
stowed positions or the seat is in the front position
and being simultaneously utilized to operate the
backhoe loader machine when the first and second
10 tower assemblies are in the operating positions and
the seat is located in the rear position (144).

11. A tiltable control console as claimed
in any of claims 6 to 10, wherein the stowed
15 positions of the first and second tower assemblies
define a predetermined space between the seat and the
respective first and second controllers and the
operating positions of the first and second tower
assemblies define a predetermined space between the
20 seat and the respective first and second controllers
that is less than the predetermined space defined by
the stowed positions of the first and second tower
assemblies.

25 12. A tiltable control console as claimed
in any of claims 6 to 11, wherein the first and
second controllers are positioned adjacent a
predetermined portion of the seat when the respective
first and second tower assemblies are in the
30 operating position.

13. A tiltable control console as claimed
in any of claims 6 to 12, wherein the first and
35 second controllers operate the respective specific

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5 functions of the backhoe loader machine through the
incorporation of pilot hydraulic controls.

14. A tiltable control console
substantially as hereinbefore described with
10 reference to and as shown in the accompanying
drawings.

15. A backhoe loader machine for use by an
operator, the backhoe loader machine having a frame,
15 a cab mounted on the frame with front and rear
interior portions, and a seat positioned within the
cab and having a centerline, comprising:

a control console including at least one
tower assembly positioned within the rear interior
20 portion of the cab and tiltably mounted thereto and
at least one controller connected with the at least
one tower assembly for operating specific functions
of the backhoe loader machine, the at least one tower
assembly being movable between a stowed position and
25 an operating position.

16. A backhoe loader machine as claimed in
claim 15, wherein the control console may be
positioned on either side of the centerline of the
30 seat.

17. A backhoe loader machine as claimed in
claims 15 or 16, wherein the stowed position defines
a predetermined space between the seat and the
35 control console and the operating position defines a

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5 predetermined space between the seat and the control
console that is less than the predetermined space
defined by the stowed position.

10 18. A backhoe loader machine as claimed in
any of claims 15 to 17, wherein the seat includes at
least one armrest and the control console is
positioned adjacent the armrest of the seat when in
the operating position so that the operator's arm may
simultaneously rest on the armrest and the control
15 console for utilizing the controller to operate the
specific functions of the backhoe loader machine.

20 19. A backhoe loader machine as claimed in
any of claims 15 to 18, wherein the controller
operates the specific functions of the backhoe loader
machine through incorporation of pilot hydraulic
controls.

25 20. A backhoe loader machine as claimed in
claim 15, including another control console
operatively associated with the at least one control
console, the another control console including
another tower assembly positioned within the rear
interior portion of the cab and tiltably mounted
30 therewith and another controller connected with the
another tower assembly for operating additional
specific functions of the backhoe loader machine, the
another control console being positioned on one side
of the centerline of the seat opposite the at least
35 one control console, the another tower assembly being

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5 movable between a stowed position and an operating
position.

10 21. A backhoe loader machine as claimed in
claim 20, wherein the operating positions of the at
least one and another tower assemblies allows the
operator to simultaneously utilize the at least one
and another controllers to operate the respective
specific functions of the backhoe loader machine.

15 22. A backhoe loader machine as claimed in
claims 20 or 21, wherein at least one and another
controller operate the respective specific functions
of the backhoe loader machine through the
incorporation of pilot hydraulic controls.

20 23. A backhoe loader substantially as
hereinbefore described with reference to and as shown
in the accompanying drawings.

25 24. A method of operating a backhoe loader
machine having a frame, a cab mounted on the frame
with front and rear interior portions, and a seat
positioned within the cab and rotatably mounted
thereto for movement between front and rear positions
30 and having a centerline, comprising the steps of:

 mounting a control console within the rear
interior portion of the cab for movement between
stowed and operating positions;

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5 maintaining the control console in the
 stowed position when the seat is in the front
 position;

 rotating the seat from the front position
 to the rear position; and

10 moving the control console from the stowed
 position to the operating position so that an
 operator may utilize the control console for
 operating specific functions of the backhoe loader
 machine.

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 25. A method of operating a backhoe loader
 machine as claimed in claim 24, including the steps
 of:

 providing another control console within
20 the rear interior portion of the cab for movement
 between stowed and operating positions;

 maintaining the another control console in
 the stowed position when the seat is in the front
 position;

25 rotating the seat from the front position
 to the rear position;

 moving the another control console from the
 stowed position to the operating position so that the
 operator may utilize the another control console for
30 operating additional specific functions of the
 backhoe loader machine.

 26. A method of operating a backhoe loader
 machine as claimed in claim 25, including the steps
35 of:

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5 providing each of the control consoles with
a tower assembly for tiltably mounting the control
consoles; and
 providing each of the control consoles with
a controller connected with the respective tower
10 assembly for operating the specific functions of the
backhoe loader machine.

 27. A method of operating a backhoe loader
machine as claimed in claims 25 or 26, wherein the
15 step of moving the control consoles from the stowed
position to the operating position includes the steps
of:

 positioning the control consoles on
opposite sides of the centerline of the seat with the
20 respective controllers adjacent a respective armrest
of the seat so that each of the operator's arms may
simultaneously rest on the respective armrest and the
respective control console for utilizing the
controllers to operate the respective specific
25 functions of the backhoe loader machine.

 28. A method of operating a backhoe loader
machine as claimed in claims 26 or 27, wherein the
step of providing each of the control consoles with a
30 controller for operating the specific functions of
the backhoe loader machine includes the step of:

 operating the specific functions of the
backhoe loader machine by incorporating pilot
hydraulic controls actuated by the controllers.

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- 5 29. A method of operating a backhoe loader machine substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

**INVESTOR IN PEOPLE**

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25/00

Other: Online:WPI,EPODOC,JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2224559 A (Kubota)	
A	US 5002332 (Kubota)	
A	US 4140200 (Tucek)	

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X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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